

KLMN Joint Geology/Soils Scoping Meetings
(March 1-4, 2004)

Meeting notes by: Hanna Waterstrat

March 5, 2004

Lassen Volcanic National Park

1) **Geology Mapping Status**

- a) Introduction to GRD/GRE program (PowerPoint by Tim Connors, NPS GRD)
- b) In September 2000, there was a volcano hazards workshop for LAVO in Redding. At this time, USGS said that they had done extensive mapping in the area, and were working on a digital dataset for the LAVO area. At the time, this information was not accessible or complete. Where are they with that?
- c) Conference call with Mike Clynne, USGS
 - i) 1:2723 map of Lassen Peak/ Chaos Crags area-- "Geologic Map of Lassen Volcanic National Park and Vicinity."
 - (1) 1:50,000 I-map includes park and vicinity, covering all quads of interest (except NW corner of Viola quad). This map is available digitally.
 - (2) Mike Clynne can preprint a copy for LAVO
 - (3) This map is not released yet, and the metadata is not complete.
 - (4) Expected release date-- by March of next year? Maybe longer (has not made it to publishing group at this time)
 - (5) To obtain datasets, contact Mike Clynne. Must write a formal letter with an official request.
 - (6) The mapping was done at 1:24,000. USGS plans to release the same map at that scale sometime in the future.
 - (7) Output files for this map are ArcInfo
 - ii) Lake Almanor sheet completed (1:100,000)
 - iii) Burney/Eagle Lake project was stopped by USGS, currently they are looking for funding to complete this. (end of conference call)
- d) Concerns with Geological Mapping
 - i) I&M program has 2008 goal. Will we be able to meet this goal?
 - ii) How can we prioritize or push USGS to finish important projects?
 - (1) NPS GRD has a USGS liaison
 - (2) NPS not funding geological mapping projects for LAVO, so must wait for USGS. There have been past frustrations with waiting for maps to be published.
- e) Tim Connors will request a preprint of LAVO area map for NPS. This will not fulfill GPRA goal at this time (no metadata), but will still be useful.
- f) Geological Map Bibliography-- not complete, but a good start. GRD will continue to work on this.

2) **Soils Mapping Status** (Pete Biggam, NPS)

- a) Introduction to I&M soils program (PowerPoint. Also gave a handout-- NPS Soils I&M Status- KLMN)
 - i) Need for good information about soil resources
 - ii) NCSS-- National Cooperative Soil Survey. This partnership (USFS, BLM, NPS, NRCS) ensures the consistency of data collection and data management through soil survey standards.
 - iii) NASIS-- National Soils Information System. Soil resource database.
 - iv) Soil surveys can be made to incorporate park-specific management concerns, and contain information like "Ecological Site Descriptions," which provide managers with information on soil-plant relationships.
 - v) Soil Resource Inventories (SRI) help networks with vital signs monitoring.
 - (1) The concepts of soil quality and function are important
 - (2) Consider monitoring at landscape level, focus on ecosystem processes

3) **Soil Resources** (PowerPoint-- Dave Smith, CA. State Soil Scientist, NRCS Davis, CA)

- a) NCSS
 - i) Soil survey crew in Butte County, CA
 - ii) Developing long-range plans for CA NPS networks
- b) Soil Surveys
 - i) Delineate like bodies of soil as polygons, across landscape
 - ii) Mapping soils involves knowledge of parent materials, climate, time, relief, soil forming factors, and associated plant communities.
 - iii) Ecological Site Descriptions can be used as a management tool
 - (1) Understanding the role of disturbance on soil resources-- change over time in soil quality and plant communities.

4) **There is NO soils map for LAVO**

- i) There is an existing soils map for USFS land surrounding LAVO

- 5) Need an **on-site soils scoping session at LAVO**
 - a) Mid-**October 2004**, 2 days. Confirm this date by April 1, 2004.
 - b) Will see a product 2-3 years after initiation.
- 6) What about network/ I&M goals?
 - a) Difficult to coordinate issues, resources, and people
 - b) Differences between parks
 - c) What is the best way to address these goals?
- 7) **Geological Issues** (Sid Covington, NPS GRD)
 - a) Want to identify issues of concern to management, park ecosystem
 - b) Volcanic Hazards
 - i) Hazard Plan?
 - (1) This involves contacts, FEMA, and emergency response
 - (2) Is USGS responsible for this? Louise thinks they should be
 - c) Seismic Activity
 - i) Ongoing. This is certainly an area of interest, lately there have been many long-duration small events.
 - ii) Working with USGS for better seismographs
 - iii) 9 seismographs in vicinity, including 3-4 in park
 - d) Geothermal Issues
 - i) Mostly in Southern part of park
 - ii) Cathy Janick (USGS) has been monitoring geothermal activity in LAVO for 20 years. She will be retiring soon, and Louise is concerned. Will this work be continued?
 - iii) Need better mapping of geothermal areas-- more detail, consistency
 - (1) All geothermal areas have been identified, there are some that have been mapped, most of these maps are not digital.
 - (2) Patrick Muffler has done detailed maps of thermal areas (**MF-1484**). **Louise would like this digitized. GRD can do this.**
 - iv) Sulfur Works-- there is a spot here that might take over the road. Mudpots and fumaroles are growing. There is lots of change in this area, it is very active.
 - (1) Need for consistent monitoring
 - v) Geothermal Hazards
 - (1) Visitors
 - (2) Park Staff-- trail crew replacing boardwalk over geothermal area
 - (3) Building new Visitor Center
 - e) Water Quality Issues
 - i) Drinking water at LAVO is all surface water except for one well at a ranger station, which is not for public consumption
 - f) Wetlands
 - i) Fens and floating bogs
 - (1) Research going on currently
 - (2) Restoration concerns
 - ii) Hydric soils are mapped as part of soil survey
 - (1) Tie in with water resources
 - iii) Need to look at landforms, geomorphology
 - g) Inventory and monitoring issues at LAVO
 - i) How does monitoring follow inventories?
 - ii) Monitoring
 - (1) Best to integrate geology, vegetation, soils, geomorphology, hydrology, soils.
 - (a) How do geomorphic features relate to geology and soils maps? Both have geomorphic components.
 - (2) Monitoring goals of soils I&M
 - (a) Soil
 - (b) Site stability
 - (c) Hydrology
 - (d) Biotic integrity
 - h) LIDAR
 - i) LAVO interested in using LIDAR
 - (1) Potential problems with canopy cover impairing ability to see soil surface
 - i) Forest Health Monitoring Network (USFS)
 - i) Can LAVO access this information for the area?
 - j) Most important geological issues at LAVO
 - i) Geothermal activity
 - ii) Water quality

iii) Wetlands

March 2, 2004

Whiskeytown National Recreation Area

1) Geology Mapping Status

- a) GRD/GRE PowerPoint (Tim Connors)
- b) WHIS has 2 libraries (cultural & natural resource) with NO bibliography
- c) There is a digital geologic map that covers entire park boundary. Data compiled from different source maps, and digitized from an older, 1960's map. There are metadata.
- d) Brian Rasmussen on the history of geology mapping at WHIS.
 - i) Wanted geology maps digitized because of past land use issues, old mines and water quality issues.
- e) Additional mapping needs
 - i) GRD will digitize GQ-336, geological map of the french gulch quad (1:62,500) and PP-285, geological map of West Shasta copper-zinc district (1:24,000)
 - ii) GRD will evaluate 97-03 and sheet 4 for digitizing and relevance
 - iii) What about map coverage outside of park? Quads of Interest?
 - (1) North-- Clear Creek watershed an area of concern because of past land use issues.
 - (2) There is a 100k map done by CA mines and geology, covering all quads of interest. Might be digital.
 - (a) Brian was not aware of this, and would like to have a copy.
 - (b) GRD will contact CA mines and geology, see if the map is indeed digital, and evaluate its relevance and quality

2) Soils Mapping Status

- a) 1965 Soil Survey for Shasta County area
 - i) NRCS is currently digitizing this survey to NCSS and FGDC standards
 - (1) Spatial data will be available in a few months, but updates (to include more detail, park-specific management concerns) and map unit descriptions will take longer.
 - ii) Older soil surveys often were geared more towards forestry practices
 - (1) Now, soil surveys are done to emphasize linkages and need for integration between geology, soils, geomorphology, hydrology, and plant communities.
- b) Brian concerned about being able to use soils information
 - i) Restoration implications? Rare plant community at WHIS (Puccinellia). Restoration efforts might fail unless hydrogeology and soils information are considered.
 - ii) Soils I&M can provide help by soil map unit descriptions, ecological site descriptions, and soil fact sheets
- c) How can we use these datasets at the Network level?
 - i) Invasive plant species and the ecological factors influencing spread

3) Geological Issues

- a) Aeolian processes present, but not of concern.
- b) Water Resources
 - i) Degraded salmonid habitat of Clear Creek below the dam due to less gravel input
 - ii) Shoreline erosion (however, dam releases are predictable)
 - iii) Bureau of Reclamation has jurisdiction over Whiskeytown Lake, there is not much of a relationship between the BOR and NPS.
- iv) Wetlands
 - (1) All related to lake and riparian areas
 - (2) Puccinellia habitat
- v) Groundwater
 - (1) Wells are high in Fe, Al because of geology
 - (2) Septic tanks are present near drinking water wells. This is mitigated by water quality testing.
- vi) Hazards
 - (1) Debris Flows
 - (a) Most originate on old logging roads
 - (b) Influenced by Decomposing Granite soils, high in biotite and very erosive
 - (c) Debris flows have happened on all creeks on the South side of WHIS
 - (d) Difficulty dating past debris flows
 - (e) Major debris flow occurred in 1997, and has happened at least 2 times in last 50 years.
 - (f) Hazardous to facilities existing downstream
 - (g) Fire might increase potential for debris flows by increasing hydrophobicity in soils
- vii) Paleontology
 - (1) Might have resources in Bragdon formation (sedimentary unit-- mississippian) in N part of park.
- viii) Past Land Use
 - (1) **Mining**

- (a) Many abandoned mine sites at WHIS from gold mining in 1850's, some are historical sites
 - (b) Need mine inventory, perhaps not all old mines have been identified or mapped
 - (c) Safety issues
 - (i) Have closed some mines off with bat gates, fencing. Might be able to use PUF caps as well.
 - (d) Acid Mine Drainage
 - (i) From mining of pyritic ore bodies
 - (ii) Sulfuric Acid leaking into water table?
 - (e) Mercury contamination (and other heavy metals)
 - (i) From gold mining practices
 - (ii) Dredge tailings could be a source of mercury, should not be disturbed
 - (iii) Mercury has been found in stream macroinvertebrates
 - (f) Iron Mountain Mine
 - (i) EPA Superfund site, adjacent to NE corner of park
 - (ii) Most acidic water in the world (pH of -3.5)
 - (iii) Mining history includes copper, iron, zinc, and gold
 - (iv) Possible impact on park because of hydrology in fractured bedrock, difficult to predict.
- (2) **Roads**
 - (a) Removal of old logging roads
 - (b) Old roads have role in erosion and debris flows
- ix) **Unique Geological Features**
 - (1) Serpentine Soils
 - (a) These do exist in the park, but are not well mapped. There might be additional areas of serpentinitic soils that are not known at this time.
 - (2) Shasta-Bally Batholith
 - (3) Steep relief
 - (4) High biodiversity of plant life related to geology and soils
- x) **Seismic Activity**
 - (1) Does exist, but not associated to any disturbance. Major faults are inactive. There is a seismograph in the mine at NEED camp.
- xi) **Monitoring Issues**
 - (1) Monitoring efforts should be geared towards the uniqueness of park and its disturbance regimes.
 - (2) NOAA climate station at WHIS
 - (3) Debris Flows
 - (a) Would like to study and monitor these long-term. Interested in more mapping.
 - (b) Measuring soil moisture and slope hydrology would be good, but there are problems because the sites are inaccessible, and there is no funding.
 - (4) Land Use/ Soil Compaction
 - (a) Fire Management-- be aware of soil resource in management decisions. Limit vehicular traffic and masticators, especially on DG soils.
 - (5) How does the combination of disturbance (from fire and roads), along with geology and soils, affect plant communities? What was historical vegetation?
- xii) **Major Geological Issues at WHIS**
 - (1) **Relic roads and their impact on erosion and debris flows.** Could use experience from REDW to assist with restoration efforts.
 - (2) **Acid Mine Drainage and associated contamination.**

March 2-3, 2004

Redwood National and State Parks

1) Geology Mapping Status

- a) GRD/GRE PowerPoint (Tim Connors)
- b) 63 quads of interest identified by park
 - i) REDW is heavily involved in land use and resource management activities outside of park boundaries. Headwaters and upstream areas of park watersheds are in private and other federal lands.
- c) Large Scale Mapping
 - i) CA Mines and Geology (now CA Geological Service or CAGS) published many (15?) 1:24,000 quads within quads of interest (but not inside park)
 - ii) Humboldt State University (HSU) geological mapping projects
 - (1) Harvey Kelsey has done work in area of Fern Canyon quad
 - (2) These maps may be unpublished, and are not included in procite database at park. May be able to access by data mining efforts at HSU. REDW very interested in getting this data.

- iii) Large scale maps NE of park not really of interest
 - d) 1:62,500 maps
 - i) OF-81-496
 - (1) This map is good, but there is a need for more detailed mapping of bedrock units (the map shows entire W side of Redwood Creek Basin as Schist).
 - (2) Sam Morrison (BLM) says this map won't relate to things done regionally. Need to tie in with regional geology.
 - ii) No interest in MF 1423, 1470. Outside area of concern
 - e) **Need geological maps of Prairie Creek area, as well as Mill Creek Watershed** (Mill Creek is area of proposed boundary expansion).
 - f) 100k-162.5k maps
 - i) MF 2336 is already digitized and available online
 - g) 250k maps
 - i) Weed Sheet (1963). This map is digitized, and frequently used, but there are problems with it. This is not a good scale for resource management, it is old, and a composite of other mapping. Does not show detail or small features.
 - h) Need for other maps?
 - i) Yes. However, there are no active USGS mappers interested in area.
 - ii) Will follow up with Harvey Kelsey at HSU to get data. Will cover some of Prairie Creek drainage.
 - iii) More detailed, large scale maps needed. Other maps don't show features where landslides have occurred.
 - iv) Difficult to do geological mapping in RNSP because of thick vegetation
 - v) Need to acquire NCWAP geomorphic map (1:24,000) from CA state. Is still unreleased, but should be available soon. Contact for this is Jim Falls.
 - vi) 1:24,000 maps desired by REDW
 - (1) Fern Canyon
 - (2) Orick
 - (3) Holter Ridge
 - (4) Ah Pah
 - (5) Hiouchi
 - (6) Childs Hill
 - (7) Cant Hook Mountain
 - (8) Sisters Rocks
 - vii) REDW has GIS layer of watersheds
 - viii) Coastal geologic maps
 - (1) Needed for Crescent City down to Orick quad (REDW preparing for coastal marine inventory).
 - (2) There is LIDAR data from coastline, but REDW can't get it converted for their use because it isn't a big enough job for them to want to do. May want to attempt to get LIDAR data for all Pacific Coast parks at once. GRD is getting LIDAR for soils I&M, may be able to incorporate REDW.
 - (3) **LIDAR is biggest mapping need at REDW.** It would be especially helpful in mapping landslide areas.
Second priority is bedrock mapping for watersheds.
- 2) **Soils Mapping Status**
 - a) NPS and NRCS actively mapping RNSP. Anticipated date of completion is 2007.
 - b) Product will be Soil Resource Inventory (soil survey) meeting NCSS and FGDC standards
 - c) Area covered by this soil survey will be RNSP, including the Lower Park Protection Zone (Redwood Creek), and Mill Creek (area of proposed expansion).
 - d) Joe Seney (NRCS) presented RNSP soil survey progress and initial results
 - i) Provided the following materials
 - (1) "USDA NCSS Workplan Between the NRCS, NPS, and CA Parks and Recreation Update 2004. The Making of a Soil Survey for RNSP, parts of Humboldt and Del Norte Counties, California. CA605"
 - (2) "Soil Survey of RNSP, The Lower Park Protection Zone and Mill Creek Watershed, Humboldt and Del Norte Counties, California."
 - ii) Materials from this presentation are available at KLMN office, or contact Joe Seney for more information.
 - iii) Field work for this project completed by May 2004
 - iv) Interim final product by March 2005
 - v) Has released digital data from this project annually
 - vi) Permit process for research has been time consuming and difficult
 - e) Soil Resources and Mapping needs in RNSP
 - i) Interested in water movement
 - ii) Want to correlate soils data with landform information to look at geomorphic processes (esp. landslides)
 - iii) Want to develop local interpretations of survey data
 - iv) Possible to leave data loggers in to keep getting information from transects for monitoring purposes.

- v) GRD looking at chronosequences, other soil resource inventories. PhD student at Berkeley using cosmogenic dating on soil near RNSP and studying buried soil horizons.
- vi) What are the rare soil types in RNSP and how do they influence plant habitats?
- vii) Need to look at implications of soil survey for trails and buildings
- viii) Interest in contracting for LIDAR

March 2-3, 2004

Redwood National and State Parks (con't)

1) Geological Issues

- a) Aeolian Processes
 - i) Coastal Dunes
 - (1) Issues include snowy plover habitat, exotic plants. European beach grass makes dunes less dynamic (more stable), and less suitable for snowy plover habitat.
 - (2) No vehicular traffic on dunes. No more RV use on Freshwater Spit. Freshwater Spit is a potential restoration area.
 - ii) No problems with wind erosion.
- b) Fluvial Processes and Issues
 - i) Expansion legislation mandated sediment/ erosion studies.
 - ii) Redwood Creek listed as sediment and temperature impaired under Clean Water Act.
 - iii) REDW has been monitoring hydrological processes in the park since 1970's
 - (1) Cross sections
 - (2) Changes in pool/ riffle distribution over time
 - (3) Pebble counts
 - (4) Facies mapping of streambed materials
 - iv) Hydromonitoring program measures discharge and turbidity.
 - v) Streams have been impacted by upstream land use-- runoff from logging.
 - (1) Lower 40% of Redwood Creek is RNSP, upper 60% on logged (private) land
 - (2) NPS involved in surveying of roads on private lands, and geologists have input to Timber Harvest Plans (THP). As far as road management is concerned, NPS has a good working relationship with timber companies. Efforts have resulted in moving some roads to more stable locations.
 - (3) Question: How does timber harvest affect streams?
 - (a) Sediment loading. Sometimes it can be difficult to tell where sediment is coming from.
 - vi) Old landslides have affected riparian structure and vegetation.
 - vii) Estuarine Issues
 - (1) Levees on Redwood Creek have straightened the mouth of the creek, and now "it blows straight out," there are no curves. This resulted in the loss of estuarine habitat. There are geological cross sections through estuary.
 - (2) Klamath River: estuary monitoring efforts done by USFS and Yurok Tribe.
 - (3) USGS has water quality data.
 - viii) Wetlands Issues
 - (1) Very limited wetlands in RNSP
 - (2) Artificial wetlands exist, which now support wetland species.
 - (3) Seasonal seeps important for elk habitat in prairie areas
 - (4) KLMN Wetlands Inventory in FY06
 - (a) Need for inventory to identify wetland areas at RNSP
 - (b) Soil survey can aid in identifying these areas, at least the ones that are more than 4 acres in size.
 - (c) Western Lily (T&E species) habitat is wet areas in Prairie Creek formation.
 - (5) National Wetlands Inventory website may have relevant spatial data.
 - ix) Lacustrine Issues
 - (1) NO Lakes
 - (2) Some artificial ponds
 - (3) Lagoon Creek Pond has tsunami deposits
 - x) Groundwater Issues
 - (1) Not very much is known about groundwater at RNSP, surface water issues tend to dominate.
 - (2) Study done at Mill Creek-- water source for campground is a well. Drawdown from this well might be stranding Coho (T&E) in the creek. Need for further study and assesment.
 - (3) State study at Prairie Creek campground evaluating water quality issues related to septic systems. Not sure of the status of this study-- will there be further investigation? What are the results?
 - (4) Petrochemicals found in Lagoon Creek Pond. Unsure of the source, might be groundwater related?
 - xi) Water Quality Issues

- (1) Stream temperature monitoring in Redwood and Mill Creeks. Temperature is related to stream channel morphology changes and canopy removal.
- xii) GEOHAZARDS
 - (1) **Landslides**
 - (a) Landslides are sometimes natural, but can be accelerated by timber harvest and roads.
 - (b) Debris torrents have been channelized and very destructive.
 - (c) One significant impact of landslides is increased sedimentation.
 - (d) Rockfalls have been associated with landslides.
 - (e) Large, dormant landslide features exist which are currently being mapped.
 - (i) Smaller, active landslide features are of more concern.
 - (f) Landslides are hazards to trails and roads.
 - (i) There are no facilities with landslide hazards. Campgrounds are all on floodplains, and aren't affected by landslides. But they do flood, or are affected by flooding. Septic systems have had problems in the past.
 - (g) Erosional and landslide hazards were mapped on Redwood Creek by Steve Coleman in 1973.
 - (h) 1997 storm involving approximately 400 landslides took out some major roads and culverts.
 - (i) Road restoration and removal efforts appear to be working. Landslides have decreased in these areas.
 - (i) Roads for RNSP visitors are gravel
 - (ii) Worst of old logging roads ("haul roads") have already been removed
 - (j) Requa facility was built on an earthflow soil, but is being abandoned.
 - (k) Landslide events mostly occur in winter, when visitation is low.
 - (l) 1978 coastal landslide map exists
 - (2) **Seismic Activity**
 - (a) Very active area, magnitude 6 earthquakes relatively frequent.
 - (b) Could be affected by larger, cascadian event (magnitude 9)
 - (i) These events in 500 year intervals
 - (ii) Concern about landslides and tsunamis. Tsunamis could take out many park facilities.
 - (c) RNSP has seismic stations
 - (d) There could be damage from earthquakes by ground shaking and liquidification.
 - (e) Large tsunami (around 1700) is recorded in wetland sediment cores. Coring done by Gary Carver.
 - (i) Native American oral histories describe tsunami events
 - (3) **Paleontology**
 - (a) Petrified wood with ammonites found at Gold Bluffs Beach deposit. This was used to date the Franciscan formation (150 mya).
 - (b) Diatomaceous cherts
 - (c) Palynology (fossil pollen) studies done adjacent to park, indicative of past climate.
 - (4) **Mining**
 - (a) Sand and Gravel Mining does occur near RNSP
 - (b) Nickel/ Cadmium mining proposed North of RNSP
 - (c) Some illegal rock collection occurs at diatrema in park because of its unique geology
 - (5) No caves and karsts, except for some very small sea caves. Ron Kerbo will look into listing sea caves under Federal Cave Resource Protection Act.
 - (6) **Serpentine Soils**
 - (a) A trail goes through one serpentine unit, and REDW would like to limit impact on this soil
 - (b) No asbestos hazard from serpentine soils. There is a high level of asbestos in some water sources, but this is not considered harmful.
 - (c) Serpentine soils in wetland areas provide habitat for Darlingtonia, a rare plant. This should be looked at as part of a wetlands inventory.
 - (7) **Coastal/ Marine Issues**
 - (a) January 2004 meeting
 - (b) Park boundary extends 1/4 mile from shore
 - (c) Want to know more about offshore sediment transfer
 - (d) Concerned about oil spills from tanker traffic
 - (e) Don't know enough about coastal processes
 - (f) Rock climbing and social trails to coastal features
 - (i) Californiacoastline.org published photos of entire CA coastline on website
 - (ii) Climbing use of coastal areas increasing
 - (iii) Look into getting a climbing management plan
 - (8) **Geological Interpretation**
 - (a) GMP identifies geology as an interpretive theme
 - (b) GIP not planned for the near future, but always a possibility

- (c) Grad student currently developing interp manual for RNSP
- (d) Would like to have a road guide to RNSP that includes soils and geology features, to give to visitors who might not leave their cars
- (e) GRD has an outreach branch that may be able to help RNSP
- (f) RNSP has resource management person that works as a liaison to park interpreters
- (9) Wrap up of Geological Issues, and other comments
 - (a) LIDAR and other coastal geomorphic mapping-- if interested, talk to Rebecca Beavers.
 - (b) Bedrock mapping for coastal area? There is a need for a new project, and to be complete, it should include soils, geomorphology, and vegetation.
 - (c) NPS "Knowledge Centers" web based
 - (d) HSU "Watershed Continuum" web based
 - (e) Tim Connors has access-based database for geological maps
 - (f) **Geological Issues of greatest concern at RNSP involve Fluvial Processes and watershed issues**
- (10) Monitoring Concerns
 - (a) RNSP does have air quality monitoring station
 - (b) RNSP does not have complete vegetation mapping, or a base layer at any scale. Would like to see future efforts combine geology, soils, and vegetation mapping for monitoring.

March 3, 2004

Crater Lake National Park

1) Geology Mapping Status

- a) GRD/GRE PowerPoint
- b) CRLA doesn't use procite database
- c) Charlie Bacon, USGS
 - i) Started mapping at CRLA in 1979
 - ii) Current work is a geological map of the CRLA area (wider than park boundary, but not as tall). Scale is 1:24,000. Bedrock and surficial geology. Will be published as a color I-map maybe by end of 2004.
 - iii) Other current work includes 11 geologic panoramas of the caldera wall, and a fantasy map, "Charlie's map of what's under the dirt," which shows bedrock units of CRLA.
 - (1) Also has geochronology of Mt. Mazama, which will be published after map is released in the bulletin of the Geological Society of America.
 - iv) Charlie's work is in ArcInfo, can make available for NPS use
 - v) Has a USGS bibliography of mapping in CRLA area, will make available for NPS
- d) Other Geological Mapping Needs
 - i) Charlie's work could be expanded to cover other parts of CRLA in same scale and detail. Charlie is willing to do the work and could certainly finish by 2008 goal.
 - ii) CRLA goal to get coverage one quad beyond park boundary on all sides
 - iii) MF-1528: only a surficial "recon map," but still somewhat useful
 - iv) Other quads are in progress by Oregon Department of Geology and Mining. GRD will follow up with them to get gaps in data covered.
 - v) 1991 Sherrod map for N part of park—OR Geology might be digitizing, and NPS has it scanned.
 - vi) Helpful websites for CRLA geospatial data

#<http://vulcan.wr.usgs.gov/Volcanoes/CraterLake/#>

#<http://craterlake.wr.usgs.gov#>

#<http://geopubs.wr.usgs.gov/i-map/i2790/#>

#http://vulcan.wr.usgs.gov/Volcanoes/CraterLake/Maps/map_mazama_general_geologic.html#

Soils Mapping Status

- e) NPS and NRCS Soil survey complete!
 - i) Survey dates 1999-2001
 - ii) Meets NCSS and FGDC standards
 - iii) Soil survey available online at www.or.nrcs.usda.gov
 - (1) Ecological site descriptions available at plants.usda.gov
 - iv) Products include geospatial data and accompanying manuscript
 - (1) Includes access database created from NASIS
 - (2) Non-geospatial data includes map unit descriptions, and ecological site descriptions are on the way.
 - (3) ArcView extension has soil data viewer, which helps resource managers with soil interpretation
- 2) Jerry Weinheimer, NRCS
 - a) PowerPoint presentation on the process of CRLA soils survey (need to acquire a copy for KLMN office)
 - b) Great information and images of CRLA soils

3) Geological Resource Issues

KLMN Joint Geology/Soils Scoping Meeting, March 1-4, 2004

- a) Resource management Issues and monitoring needs will be addressed.
 - b) Seismicity and Geohazards
 - i) Low frequency of earthquakes
 - ii) Poor seismograph coverage, NO seismograph in park
 - (1) **Need to get seismograph in park**
 - c) Roads. Some areas have impacted slope, but this is not a priority because there are very few places where this has happened.
 - d) Caves
 - i) 40+ caves at CRLA, not mapped or inventoried for flora or fauna
 - ii) one cave was closed (entrance buried) by road development
 - iii) CRLA interested in mapping and inventories of caves, might be possible to work with the National Speleological Society (NSS) on this.
 - iv) There was a publication on caves at CRLA in the 1950's or 60's
 - e) **Water Resources**
 - i) In the 1980's, there was controversy over geothermal energy exploration near the park. Cal Energy did some drilling, which was opposed by the NPS.
 - (1) The political controversy centered around the impact of geothermal exploration and energy on the park. Some people were worried that drilling might drain the lake (which is not a real concern), and were also concerned about having energy facilities nearby.
 - (2) From this political controversy, CRLA was asked to inventory and monitor the lake floor for geothermal features. Later studies used submersibles, and did locate geothermal features on the lake floor.
 - (3) There is a lack of funding for geothermal studies of the lake floor. These studies are expensive, and there is not a pressing threat for the exploration of geothermal energy resources.
 - (4) CRLA was concerned that drilling might change the flow and impact of geothermal springs on the bottom of lake. This would still be a concern, if drilling were to be proposed in the area.
 - (5) Geothermal areas are now protected by the Geothermal Protection Act.
 - (6) Now, CRLA is interested in trying to drill wells for domestic water, but is apprehensive of political backlash. There are water rights issues in the area which affect the ability of the NPS to use surface water.
 - f) Geohazards
 - i) Rockfall
 - (1) Hazards exist, sometimes rocks fall on roads. However, this issue is a relatively small concern. If there was an earthquake in the Annie Creek fault zone, rockfall hazards would increase.
 - (2) Cleetwood Trail: this is the only trail down the caldera wall to the lake. There was a woman killed here by rockfall. CRLA would like consulting help on how to better stabilize the trail. GRD might be able to help with this task.
 - g) Restoration Issues
 - i) Parking lot will be moved, attempt to restore this area needs to include realistic ideas about the capacity of the soil to recover.
 - h) Disturbed Lands
 - i) Old quarries need reclaiming. Oregon Department of Geology and GRD can provide technical assistance.
 - (1) These areas have been mapped for exotic plant encroachment potential
 - (2) Hazardous materials have been found at some of these sites, which are 40-50 years old. Examples are the "summer dump" and "south yard." CRLA should contact the EQD for assistance on hazardous materials.
 - i) Paleolimnology
 - i) Would like to core lake bottom sediments and study them. Difficulties funding this project.
 - j) Volcanic Hazards
 - i) There is the potential for volcanic activity. Last eruption was 5,000 years ago. Charlie Bacon wrote a hazard report in 1997.
 - k) Unique Geological Features
 - i) Mt. Mazama is one of the most important volcanoes in the world. It is a premier geological feature, highly visited and convenient for study. Best example of active gas charged magma with a catastrophic explosion.
 - l) Interpretation
 - i) Potential exists to improve the quality of interpretive programs about Mt. Mazama.
- 4) Soils Issues
- a) Mt. Mazama explosion was an important event for Pacific Northwest soils. The ash from this explosion fed these soils
 - b) Soils at CRLA are young, and vulnerable to on-site disturbances from wind, equipment, pollution, and other natural and human impacts.
 - c) Future efforts will be towards understanding what soils might mean for vegetation, and how they might react to disturbances.

- d) Soils map is done, but more deliverables will be produced.
 - i) Ecological site descriptions will soon be included in soil survey, will help with resource management.
- e) There are hydrophobic soils on the N side of cinder cones.
- f) 2006 meeting and field trip of the International Society of Soil Scientists will pass through CRLA.
- 5) Closing remarks
 - a) **Management priorities at CRLA**
 - i) **Funding lake coring project**
 - ii) **Figuring out a solution to water rights problems**
 - iii) **Get at least one seismograph**

March 4, 2004

Lava Beds National Monument

- 1) Introduction
 - a) GRD/ GRE PowerPoint
 - b) LABE uses procite database
 - c) LABE has ArcView and ArcMap
- 2) **Geology Mapping Status**
 - a) Quads of interest—mainly concerned with the four quads surrounding park boundary (Captain Jack's Stronghold, The Panhandle, Sconchin Butte, and Caldwell Butte).
 - b) I-1804 (1:24,000) covers most of park boundary. This map is digital, and was published in 1987 (done by Julie Donnely-Nolan).
 - c) WSP-1491 (1:62,500) covers the area West of LABE. This map is somewhat coarse, and was published in 1960. However, it is still useful.
 - d) Alturas sheet (1:250,000) covers a large area that includes LABE, but is old and very coarse.
 - e) Geologic Map of Medicine Lake Volcano (conference call with Julie Donnely-Nolan, USGS)
 - i) Julie Donnely-Nolan has been working in the LABE area since the 1970's.
 - ii) This is a new map by Julie Donnely-Nolan. It has not been released or published yet. The map will be sent to the publishing group by May, and then the expected date of publication is 2005 (one year later).
 - iii) NPS will be able to use this map after it has been approved by the director (USGS).
 - iv) This map will be released as a paper map, and as a digital map.
 - v) The map will include a correlation sheet.
 - vi) Area of coverage—between the Mount Dome and Panhandle quads in the N, and between Snag Hill and Hollenbeck quads in the S. This map will cover most of the quads of interest for LABE.
 - vii) Other mapping activity: Jim Smith (USGS Reston, Virginia) is doing work in the area of the Alturas and Weed sheets. This mapping is more generalized, and some of it is digital, though it is currently unavailable due to computer problems. There is also someone with the NPS in Oakland that is doing some mapping in the area.
 - viii) Are cave openings or entrances shown on the map?
 - (1) Sometimes caves or cave entrances are considered sensitive information, and their locations are not made public.
 - (2) Lava tubes are geological features, and are shown on the map. While cave openings are not explicitly labeled, lava tubes combined with topography might give informed readers an idea where cave entrances are.
 - (3) David Larson (LABE) does not want class 3-4 caves shown on the map.
 - (4) USGS has an agreement with the Cave and Karst Institute that it will not publish cave entrance locations on any new topographical maps without the written consent of resource managers. This agreement does include lava tubes (Ron Kerbo, NPS Cave and Karst Institute). This is problematic because the USGS topographical maps that are used for new geological maps were in most cases published 20 or more years ago, before this agreement was in place.
 - (5) USGS (Julie Donnely-Nolan) will not alter the map to suit the needs of LABE or NPS, it will be published as it is. However, after publication, LABE may alter the data as it sees fit.
 - (6) In the end, it is up to the park what they want the public to know about. Right now, they are happy with USGS geological mapping efforts. In the future, when the NPS gets these digital maps, they could choose to make caves and lava tubes a separate GIS layer.
 - (7) Ron Kerbo will work with Dave Larson on cave information and laws (Federal Cave Resource Protection Act 1988).
 - ix) Other geology related publications?
 - (1) Geology of Captain Jack's Stronghold, published in California Geology? "A good geological story." This was written by Julie Donnely-Nolan and Aaron Waters. Another, similar publication was done by Donnely-Nolan, Waters, and Bruce Rogers in 1989.
 - x) Other ideas about geology and geological interpretation at LABE?

- (1) Julie Donnelly-Nolan wants to help with signs that have to do with park geology. She wants to be used as a resource for the park, and was upset that the park did not consult her earlier when designing geology exhibits for the new visitor's center.
 - (a) She would like to help with seasonal training in 2004.
 - (b) She wants to make a loose leaf notebook of photographs and accompanying descriptions of geological features. She will work with the interpretation staff to do this.
 - (2) Interest in getting a GIP, who would work with Julie Donnelly-Nolan and park staff.
 - (3) Daniel Sarr, Klamath Network monitoring coordinator, mentioned getting Julie to come to Ashland and present her work to SOU faculty and KLMN staff. This would help build partnerships.
- 3) **Soils Mapping Status** (Pete Biggam, NPS)
 - a) PowerPoint by Pete Biggam
 - b) There is a possibility that a new Soils Resource Inventory (SRI) for LABE will be done, in order to get soils mapping at NCSS standards.
 - c) Modoc Soil Survey, (1970's) covers the LABE area, but is not done to NCSS standards. Soils I&M will use this survey as a springboard for a new survey. Any new SRI that is done by NPS/NRCS will be to NCSS and FGDC standards. It will be a digital product that includes helpful information like map unit descriptions and ecological site descriptions.
 - d) There will be a soils scoping session at LABE in October 2004, and the NPS will work with NRCS to develop a new soil survey. NRCS contact person is Dave Smith.
- 4) **Soils at Lava Beds**
 - a) Biological Crusts protect the soil surface from wind and water erosion, fix Nitrogen. These sensitive soils are found at LABE in some places. However, the distribution of these soils are limited due to past cattle grazing. The last grazing took place in 1975.
 - b) What could be the impact on the soil resource of re-introducing fire at LABE?
 - c) Exotic plants—what kind of relationship does Cheatgrass have with the soil? It takes advantage of early soil moisture, robbing other plants. It also loves disturbed crust soils, because of high N levels.
- 5) **Geological Issues**
 - a) Aeolian Processes
 - i) Wind erosion at Petroglyph Point. The West face of this petroglyph feature is being eroded by wind blowing sand and gravel from the road. NPS has installed a metal shield in an attempt to protect the petroglyph. NPS has proposed removing or re-routing the road, but this idea was unpopular with locals.
 - b) Desert Crusts
 - i) Impacted by previous grazing. Interested in knowing the location, size, and distribution of these biotic crusts.
 - c) Groundwater
 - i) There is a drinking water well that is of concern to resource managers. Because there aren't distinct aquifers in the LABE area, there is uncertainty about the source and movement of groundwater. David Larson has contacted Larry Martin at the NPS WRD (Water Resource Division) for assistance. NPS is interested in finding out if well drawdown is related to agricultural uses of water by local farmers.
 - ii) USGS is conducting a groundwater monitoring program in and around the park.
 - iii) State of California is doing groundwater studies in the Klamath Basin.
 - iv) There are no problems with water quality at LABE.
 - d) Geohazards
 - i) Small rockfalls on park road, mostly related to freezing and thawing. Potential of rockfalls at Gillens Bluff area. Rock collapses are also possible in lava tubes.
 - ii) Concern about roads built over lava tubes, and the potential of collapse. Because the old road will soon be re-capped, LABE has hired a contractor (Blackhawk, contracted by Federal Highways) to study the voids under park roads and load capacity. This study could result in weight limitations on park roads. The contractor has requested permission to do coring if there are questions, but so far the superintendent is opposed to this. Also, there is 2.5 miles of the Medicine Lake Road in the park, which might be paved.
 - e) Seismic activity
 - i) There is a possibility of seismic activity. USGS has a seismograph at park headquarters, behind the building. Would be nice to move this seismograph to a more visible location, perhaps at the new VC?
 - f) Volcanic activity
 - i) Medicine Lake Volcano considered active, and likely to erupt. There is a need to find out more about this volcano.
 - ii) Volcanic Hazards Assessment needed for LABE
 - g) Paleontology
 - i) Fossils exist in some caves, theft and vandalism are issues. There are fossils of camel, jaguar, and other vertebrates. These fossils are listed in cave inventories, but have not been dated.
 - h) Caves
 - i) There are 502 known cave locations at LABE

- ii) LABE has GIS layer with all of cave openings, which is available for use only by park staff.
- iii) Lava tubes are not indestructible, damage and use should be limited.
- iv) Cave Management Plan from 1990. There is a current draft plan that LABE would like approved.
- v) One issue of concern is how to limit visitation of these caves. Managers would like protocols for doing this.
 - (1) Currently, visitors can enter caves without contacting a park ranger.
 - (2) Should the word “cave” be removed from road signs?
 - (3) Should the Cave Loop Road be turned into a trail?
 - (4) Vandalism and the breaking and removal of cave features has been a problem.
- vi) Janet Sawyers, Cave Research Foundation has done cave inventories, asking for more detailed inventories of lava tube features might be a good idea.
- vii) Bats
 - (1) 14 species of bats use caves at LABE
 - (2) There are bat gates on some caves
 - (3) LABE is buying sensors to monitor maternal colonies and bat habitat
 - (4) There is a need for funding to cover biotech and law enforcement positions that could reduce disturbance of bats.
- i) Glacial features—there is a glacial moraine deposit in the SE corner of the monument
- j) Geological Interpretation
 - i) Very interested in GIP program, and the possibility of Environmental Education interns.
 - ii) Work with Julie Donnelly-Nolan
 - iii) The loss of staff positions in this division has been a problem.
- k) Unique Geology
 - i) Cinder cones
 - ii) Fossil ice in caves. Some of this ice is being lost...why and how?
 - iii) Good example of geology influencing habitat. Remnants of an alpine environment provide habitat for Pikas, who escape the heat in small holes and lava tubes.
- l) Sand and Gravel extraction
 - i) No current activity, but borrow pits that were used until the 1960's still exist. May keep some open for geological interest and as a cultural-historical resource. Others may be restored, or in some cases, they will be left alone, depending on the possibility of ecological impacts from restoration efforts.
- 6) Soil Resource Issues
 - a) These issues will be addressed in-depth at the soils scoping session in October 2004.
 - b) Biotic soil crusts—only in small patches, impacted from past grazing (grazing ended in 1975, mainly sheep).
 - c) Volcanic ash soils—there has been soil movement around and into cave entrances.
 - d) Natural disturbance regimes
 - i) Fire
 - ii) Rodents and ants
 - iii) Frost heaving
 - e) Invasive Plants
 - i) Cheatgrass
 - ii) Mullein
 - iii) Pepperweed
 - iv) Juniper-? There has been an invasion of Western Juniper in certain parts of the monument, but it is not necessarily an invasive plant. Need to investigate the ecology of this phenomenon.
 - f) Soil compaction. Appears minimal, needs further study.
 - g) Critical habitat—Leks.
 - h) Restoration issues
 - i) Fire program. Worried about Cheatgrass invasion after prescribed burns, need better understanding of state and transition models through ecological site descriptions
 - i) Need to know more about how soils may help to protect or erode cultural resources.
 - j) Soils and interpretation
 - i) Need to provide staff with interpretive tools.
- 7) Top priorities for geological issues at LABE
 - a) Cave resources and how to reduce impact from visitors and roads
 - b) Wind erosion at petroglyph point

March 4, 2004

(I was late arriving to this meeting, and may have missed some things at the beginning)

Oregon Caves National Monument

1) Geology Mapping Status

- a) John Roth and Len Ramp made a digital map that covers ORCA boundary. This is not published. KLMN office would like to have this data.
 - b) Student from Edinburgh (Scotland) did a senior thesis making a geological map that covers part of the monument, area of proposed expansion included. This map was done in 2000, and shows a fair amount of detail. It is digital. However, ORCA doesn't have it at this time. John Roth will follow up with this person to get the data.
 - c) Hoping to get a GIP to finish geology mapping. Could be done in one season.
 - d) ORCA has GIS layer showing area of proposed expansion.
 - e) Cave Junction quad—this area has been mapped, but is not digital.
 - f) Tom Wiley, OR Geology/ Grants Pass
 - i) OR has also done some mapping in this area
 - ii) OR has a grant to digitize maps in the ORCA area, and will fix some areas of discrepancies and overlap in older mapping.
 - iii) The point of this study is to look at groundwater resources in the Illinois Valley.
 - iv) Plan to finish this work in next couple of years
 - g) ORCA area geologically complex
 - i) Age of host rock Triassic/Permian. Age of metamorphism Nevadian.
 - ii) There is some fine-grained diorite that is not mapped correctly.
- 2) Soils Mapping**
- a) 1978 Soil survey for Josephine County
 - i) NRCS database
 - ii) Good quality, very useful
 - iii) Meets NCSS standards, but doesn't contain ecological site descriptions
 - iv) Area inside ORCA boundary has been sampled by a former GIP named Antonio. He did not do soil taxonomy or interpretation, but this information can be used by soils I&M. ORCA has vegetation data from Jim Agee's work. Together, these two studies will help improve the quality of soils mapping for ORCA, and better meet park needs.
 - v) Doesn't have enough detail to show serpentinitic soils, which occur in very small amounts.
 - vi) May need better hazard mapping. In 1964, there was a catastrophic debris flow from a rain-on-snow event. There is a 1983 map of this debris flow, which is not digital (WRI-83, will be digitized by GRD). Now there are better techniques for debris flow modeling, which could be utilized. Information needed for these models includes data about available water holding capacity and permeability of soil, and the depth of soil units. Precipitation and weather data are also needed. These models may be able to predict when and where these events might happen. ORCA uses the conditions of the 1964 event as an evacuation threshold. This threshold might need to be revised.
- 3) Geological Issues**
- a) Fluvial
 - i) 2 artificial ponds, historical resources.
 - ii) Need data on stream channel morphology. Forest Service doing this kind of work in the area.
 - iii) Wetlands. All wetlands at ORCA are adjacent to streams. Deana is working on a wetlands inventory, soon to be finished.
 - iv) There are cirque lakes in area of proposed expansion.
 - b) Groundwater
 - i) Public water comes from a different drainage, and is piped in by an old CCC project. Concerned about modification of water table, which could introduce a brown algae which kills Port Orford Cedars.
 - ii) Caves can cause groundwater to "jump" surface drainages.
 - iii) Climate change models indicate more winter precipitation is falling as rain, and summers are dryer. This could lead to less charged groundwater resources, and more runoff.
 - c) Hazards
 - i) Debris flows. Need better mapping and understanding of debris flow potential.
 - ii) Landslides.
 - (1) In the past, a ranger station was lost due to slope failure.
 - (2) Federal Highways installed pylons in the parking lot, which started cracking soon thereafter despite those efforts.
 - (3) Structures at ORCA are located right at the bottom of a steep drainage, which is problematic considering fire danger and the potential for debris flow in the streams.
 - iii) Seismicity has not been a problem, although broken speleothems inside caves indicate past earthquakes. No need for a seismograph.
 - iv) No Volcanic hazards.
 - v) Serpentine soils are present (about ½ acre), and some do swell, but they are located on a flat surface, and don't pose a danger.
 - d) Paleontology

- i) Need to keep paleoresources in caves
 - ii) 50+ bone sites in cave
 - (1) vertebrates, amphibians, jaguar, and the oldest grizzly in W. hemisphere.
 - iii) Rubble pile—material was extracted from cave, has been a target of vandals and thieves.
 - iv) Interested in studying fossil pollen in sediments.
 - v) Funding for paleoclimatological study by Dr. Peter Clark at OSU.
 - vi) Invertebrate crinoid fossils in argillite sections of cave walls.
 - vii) Trying to fund paleontology projects in ORCA through NRAC. Marsha Davis (Geologist, PWR) encouraged ORCA staff to send proposals directly to her.
 - e) Cave and Karst
 - i) Entrance modifications—historical records conflict about original cave openings. Would like to restore cross-section, but need to make sure it does not adversely affect bat habitat.
 - ii) Efforts underway to restore original airflow regime
 - iii) Effects of fire suppression on cave
 - (1) Shrubs and small trees suck up surface water and reduce water flow in cave.
 - (2) Prescribed fire will be used at ORCA, and the effects of this will be compared with an unburned area.
 - iv) Sediment (soil) compaction from cavers and visitors
 - (1) Studying proposed caving route
 - (2) Compaction has an impact on soil microbes
 - (3) Deana would like assistance with sampling methodology.
 - (a) Measure changes in bulk density, infiltration, and moisture content.
 - (b) Soils I&M will send a soils fact sheet.
 - (4) What are the implications of sediment compaction at ORCA?
 - f) Unique Geological Features
 - i) Well exposed vermiculations
 - ii) Flexible flowstone
 - iii) Calcite covered vermiculations
 - iv) Exposed granitic and quartz dike
 - v) There is a publication, done by John Roth, about the unique geology at ORCA
 - g) Geological Interpretation
 - i) New VC in progress, there will be an opportunity for geological exhibits
 - ii) Want to have a book about ORCA published by 100th anniversary in 2009
- 4) Soils Issues**
- a) Terrestrial—there is some trail erosion, but it is minimal and manageable.
 - b) Climate change—may affect snowpack and soil moisture.
 - c) Disturbance regimes
 - i) Wildfire, prescribed burning, and fire suppression
 - ii) Pocket gophers in meadows
 - iii) Mountain beaver (*Aplodontia*) causes turbation (soil movement) in meadows. This helps to maintain meadows and prevent tree encroachment in these wet areas.
 - d) Invasive Plants
 - i) Declining populations of weeds
 - ii) Klamath Weed main species of concern
 - iii) Dandelions in upper meadow from horse poop
 - e) Grazing history
 - i) Sporadic cattle trespass in last 20 years has caused damage that although limited, could continue to be a concern. Worried about impact on rare plants.
 - f) Critical habitat
 - i) Riparian corridors, meadow communities. Concern about climate change drying meadows; the mountain beavers who help to maintain the meadows by preventing tree encroachment depend on the meadows to be wet. If they get dryer, the mountain beavers might leave, allowing trees to populate these areas.
 - g) Buildings/ Facilities
 - i) New septic system planned, no soils issues perceived.
 - h) Serpentinic soils
 - i) Need more information on these soils. They could be especially important for plant communities.
 - i) Past Land Use issues
 - i) Logging on adjacent lands has caused forest fragmentation and edge effects. The monument itself is old-growth.
 - j) Soil mycorrhizae inventory needed.
 - k) USFS has Forest Health Monitoring plots in the area. NPS wants to know where these plots are.
- 5) Monitoring needs?** Want to monitor water budget for cave system.
- 6) Priorities for Geology and Soils issues at ORCA**

- a)** Debris flows—mapping, modeling, evaluate hazard potential.
- b)** Fire—the effects of prescribed burning, wildfire, and fire suppression